Assessing systematic biases in the Global Forecast System

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Over the past thirty years systematic errors in the GFS were investigated by calculating time-mean forecast departures from verifying analyses; discussions of these time mean errors with model developers have helped to improve the GFS. Time-mean fields have also been used to examine proposed changes to the GFS and differences of the NCEP GFS from other global forecast systems. Comparison of GFS analyses and forecasts to observations such as radiosondes, near surface station reports and satellite observations of radiation are also needed.

Five years ago the Model Evaluation Group began presenting weekly seminars to EMC model developers emphasizing synoptic and mesoscale case studies of individual forecasts, looking at models from the forecaster's perspective. Many operational forecasters participate in MEG as well. Several systematic errors in the GFS have been identified by MEG and by forecasters; many have been addressed by EMC developers and eliminated or reduced. In recent GFS implementations MEG discussed model changes and their effects on model errors and biases with forecasters and examined several case studies suggested by forecasters.

The recent emphasis on case studies emphasizes problems in daily forecasts and biases in sensible weather forecasts. It is more closely attuned to the human forecaster's use of model forecasts. However, the GFS is a global model and the case studies examined emphasize the continental United States, leaving out much of the globe and shortchanging model problems that originate elsewhere and propagate over the United States. It is not always clear as well how systematic are problems seen in individual cases. The careful examination and discussion of global time-mean errors can yield insight into a much wider range of model problems and solutions and complements case studies. Examining the effect of system changes on model biases also helps model users prepare for model upgrades